REMARKS

Applicant appreciates the Examiner's thorough consideration provided the present application. Claims 1-14, 16, 18 and 19 are now present in the application. Claims 1, 8, 16 and 18 have been amended. Claims 15 and 17 have been cancelled. Claims 1 and 8 are independent. Reconsideration of this application, as amended, is respectfully requested.

Reasons For Entry Of Amendments

It is respectfully requested that the present amendments be entered into the Official File because the amendments to the claims are believed to place the present application into condition for allowance. In the alternative, if the Examiner persists in maintaining his rejections, it is respectfully requested that the Examiner enter the amendments for the purposes of Appeal.

Claim Rejections Under 35 U.S.C. §§ 102 & 103

Claims 1, 3-5, 8 and 11-13 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Derosier, U.S. Patent No. 6,889,759. Claims 2 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Derosier in view of Harrison, U.S. Patent No. 6,260,830. Claims 6, 7, 10 and 14-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Derosier in view of Dalzell, U.S. Patent No. 2,281,754. Claim 19 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Derosier in view of Harrison, and further in view of Lefevre, U.S. Patent No. 4,581,183. These rejections are respectfully traversed.

Complete discussions of the Examiner's rejections are set forth in the Office Action, and are not being repeated here.

In light of the foregoing amendments to the claims, Applicant respectfully submits that these rejections have been obviated and/or rendered moot. Without conceding to the propriety of the Examiner's rejections, but merely to timely advance the prosecution of the application, as the Examiner will note, independent claims 1 and 8 have been amended.

Independent claim 1 has been amended to recite a combination of elements including "[a] heat exchanger plate comprising a number of turbulence-promoting protuberances which project from the plane of the heat exchanger plate, the protuberances being spaced apart from each other by a substantially flat base portion at a bottom of the heat exchanger plate, wherein each of the protuberances has a surface profile extending over substantially the whole surface of the protuberance for promoting break-up of laminar boundary layers, and the surface profile has spherical or ellipsoid segments."

Independent claim 8 has been amended to recite a combination of elements including " [a] plate heat exchanger comprising heat exchanger plates with turbulence-promoting protuberances which are arranged in each heat exchanger plate, the protuberances being spaced apart from each other by a substantially flat base portion at a bottom of a corresponding one of the heat exchanger plates, wherein each protuberance has a surface profile extending over substantially the whole surface of the protuberance for promoting break-up of laminar boundary layers, and the surface profile has spherical or ellipsoid segments."

Support for the amendments to claims 1 and 8 can be found in previously presented claims 15 and 17 and FIG. 3 as originally filed. Applicant respectfully submits that the combinations of elements set forth in claims 1 and 8 are not disclosed or suggested by the references relied on by the Examiner.

In the present invention, each of the protuberances projecting from the plane of the heat exchanger plate are spaced apart from each other by a substantially flat zone at a bottom of the heat exchanger plate, further each of the protuberances projecting from the plane of the heat exchanger plate is substantially covered with a surface profile, having spherical or ellipsoid segments, for promoting break-up of laminar boundary layers. Therefore, a very high degree of efficiency for heat exchange is achieved. This structure results in not only increased turbulence in the flow of the fluid, but also an effective break-up of laminar boundary layers. The turbulence becomes very strong when the fluid due to the protuberances is forced to constant changes in direction. Constant changes in acceleration and retardation is achieved which is favorable when obtaining an effective mixing of the fluid and thereby an effective tempering of the fluid. Therefore, a higher flow rate through the heat exchanges is made possible and a more cost effective heat exchanger is achieved.

Derosier discloses a heat exchanger fin. The fin includes a corrugated sheet of material having a plurality of major corrugations. As shown in FIGs. 12a and 12b of Derosier, the corrugated heat exchanger fin 26 has a plurality of peaks 32 and valleys 34 with bumps 58 and/or dimples 60. The size, orientation and interrelationship of the bumps 58, the dimples 60, or the bumps and dimples together with respect to either or both surfaces of the fin 26 and with respect to either or both of the peaks 32 and valleys 34 may be varied. The variations depend on empirical determinations of how the bumps, dimples or bumps and dimples affect thermal performance, pressure drop and efficiency of a heat exchanger having a coil made of fins 26 having such components (see paragraph [0057]). The flow through the heat exchanger is intended to be across the peaks and valleys of the fins. In other words, Derosier simply discloses

a coarse structure having a plurality of *major corrugations continuously extending across the entire fin*. As shown in FIG. 12a of Derosier, the peaks 32 and the valley 34 continuously extend along the entire fin 26, and fail to be spaced apart from each other by any substantially flat zone at the bottom of the fin 26. In fact, as shown in FIG. 6 of Derosier, the fin 26 is a continuously curved/corrugated sheet without having any flat zone. Therefore, Derosier fails to disclose "*the protuberances being spaced apart from each other by a substantially flat zone at a bottom of the heat exchanger plate*" as recited in claims 1 and 8.

Applicant also respectfully submits that the claimed feature of the surface profile substantially covering each of the protuberances is one of major features of the present invention (see the discussion below regarding the analogy with the mogul skiing.) Derosier, which is the only utilized reference related to any kind of surface profile, does not disclose a surface profile that substantially covers each of the protuberances. Therefore, Derosier also fails to teach "each of the protuberances has a surface profile extending over substantially the whole surface of the protuberance for promoting break-up of laminar boundary layers" as recited in claims 1 and 8.

Applicant further respectfully submits that the difference between the present invention and Derosier is analogous to the difference between a mogul slope used in mogul skiing and a downhill slope used in downhill skiing. For mogul skiing, the skier needs to do constant changes in the direction, *i.e.*, some time going over the moguls and sometime going around the moguls. Therefore, the path followed by the skier is proportionately long and it takes quite a long time going down a mogul slope. On the other hand, for downhill skiing, the skier is taking the shortest possible path down the downhill slope and thereby going down in the shortest time possible.

The present invention is analogous to the mogul skiing because the fluid is making contact with a very large part of the surface of the plate and therefore the time spent in the heat exchanger becomes proportionately long. This permits a very effective mixing of the fluid and thereby a fast tempering in the heat exchanger. Therefore, a high flow rate through the heat exchanger and a cost effective heat exchanger are achieved.

On the other hand, Derosier is analogous to the downhill skiing because the fluid will take the shortest possible path (along the corrugations) and therefore reduces its contact area with the heat exchanger plate. In addition, the time spent by the fluid in the heat exchanger will be short (as compared with the mogul skiing analogy). A small contact area and a short time spent in the heat exchanger results in poorer mixing of the fluid and thereby proportionately slower tempering of the fluid. Consequently, a proportionately lower flow rate through the heat exchanger is achieved, which results in a less cost effective heat exchanger. Therefore, the structure of Derosier is totally different from the present invention.

With regard to the Examiner's reliance on the second references, these references have only been relied on for their teachings related to some dependent claims. These references also fail to disclose the above combinations of elements as set forth in amended independent claims 1 and 8. Accordingly, these references fail to cure the deficiencies of Derosier.

Accordingly, none of the utilized references individually or in combination teach or suggest the limitations of amended independent claims 1 and 8. Therefore, Applicant respectfully submits that amended independent claims 1 and 8 clearly define over the teachings of the utilized references.

In addition, claims 2-7, 9-14, 16, 18 and 19 depend, either directly or indirectly, from independent claims 1 and 8, and are therefore allowable based on their respective dependence from independent claims 1 and 8, which are believed to be allowable.

In view of the above remarks, Applicant respectfully submits that claims 1-14, 16, 18 and 19 clearly define the present invention over the references relied on by the Examiner. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103 are respectfully requested.

CONCLUSION

All the stated grounds of rejection have been properly traversed and/or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently pending rejections and that they be withdrawn.

It is believed that a full and complete response has been made to the Office Action, and that as such, the Examiner is respectfully requested to send the application to Issue.

In the event there are any matters remaining in this application, the Examiner is invited to contact Cheng-Kang (Greg) Hsu, Registration No. 61,007 at (703) 205-8000 in the Washington, D.C. area.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant respectfully petitions for a one (1) month extension of time for filing a response in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Dated: June 10, 2009

Respectfully submitted,

By _____

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